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Cancer Letters xx (2005) 1–5
CANCER Letters
www.elsevier.com/locate/canlet

Incidence and age distribution of colorectal cancer in Iran: Results of a population-based cancer registry

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Received 20 March 2005; received in revised form 8 September 2005; accepted 8 September 2005

Abstract

Epidemiologic patterns of colorectal cancer (CRC) in Iran have not been studied adequately. In a recent cancer registry and active cancer surveillance, we collected data on the incidence of colorectal tumors in five provinces of Iran from 1996 to 2000.

In total, 2055 were registered in this study. Age-adjusted rates of CRC in Iranian males and females were 8.2 and 7.0/100,000, respectively. Seventeen percent of the cases were younger than 40 years of age at the time of diagnosis. This proportion was similar to proportions seen in many other Middle-Eastern countries, but much higher than those seen in Western countries. A comparison of age-specific rates between Iran and the US showed similar rates in young (<40 years) Iranians and Americans, but much lower rates in older (≥ 40) Iranians.

We conclude that Iran is still a country with low-risk of CRC, particularly for older individuals. The high proportions of young CRC cases seen in Iran, and probably many neighboring countries, are due to the young age-structure of these countries and relatively low rates of CRC in older individuals.

Keywords: Colorectal cancer; Incidence; Iran

1. Introduction

Colorectal cancer (CRC) is the third most common cause of cancer death in the world [1]. Epidemiologic features of CRC, such as its incidence and age distribution, vary widely in different parts of the world [2,3]. While the annual incidence of CRC in

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0304-3835/$ - see front matter © 2005 Published by Elsevier Ireland Ltd.
doi:10.1016/j.canlet.2005.09.004

North America and Europe is approximately 30–50/100,000 [2], this incidence is estimated to be approximately 3–7/100,000 in most Middle-Eastern countries [4,5]. In Western countries, only 2–8% of all CRCs occur in young (<40 year-old) patients [6–10]. In contrast, several studies have shown that 15–35% of CRCs in Middle-Eastern countries occur in <40 year-old subjects [11–13]. Some authors have suggested a difference in genetic susceptibility to cancer to explain the widely different proportions of CRC between Middle-eastern and Western countries.

Epidemiologic features of CRC in Iran have not been studied adequately yet. In this article, we aim to present the first comprehensive report on the incidence and age distribution of CRC in Iran, using 5-year data from active cancer surveillance and cancer registry in five provinces of Iran, and to compare rates in Iran with those in the US, as an example of a developed country.

2. Subjects and methods

The data used in this study were collected in a recent cancer registry and active cancer surveillance that was conducted by the Digestive Disease Research Center (DDRC) of Tehran University of Medical Sciences under the supervision of the IARC. This cancer registry was conducted in five of the 28 provinces of Iran, namely Gilan, Mazandaran, Golestan, Ardabil, and Kerman, for a period of 5 years (1996–2000). Gilan, Mazandaran, and Golestan are located in north of Iran, in the southern border of Caspian Sea. Ardabil and Kerman are located in northwestern and south-central Iran, respectively. The total population of these five provinces is approximately 9.5 million, which constitutes about 16% of the total population of Iran and includes three major ethnic groups: Persian, Azari Turk, and Turkmen. Similar to the age-structure of Iran, the population of these provinces is very young: 38.7% are ≤15 years of age, and only less than 4% are >65 years. In these five provinces, 50.1% are males and 52.1% live in rural areas. Three major socio-economic indices, literacy rate, access to healthy drinking water and electricity, in these provinces were 78.0, 89.5 and 95%, respectively, which were very close to 81.8, 89.8 and 93.5% for Iran. Therefore, we believe that the population studied is representative of the Iranian population as a whole.

Details of cancer registry methods in Ardabil have been described elsewhere [18], and similar methods have been applied in the other four provinces. Briefly, in each Province, a Cancer Registry Center coordinated the activities. Survey teams, that included general practitioners and medical students, were trained to go to hospitals, pathology laboratories, diagnostic radiology clinics, outpatient public and private clinics and review medical records for cancer cases and, whenever possible, to make a copy of the documents, according to which a diagnosis of cancer was made. These were then sent to the Cancer Registry Office of the province and to the registry unit in the DDRC. In addition, the survey teams obtained and examined death certificates issued by the doctors of their Province, and the information of Ministry of Health Annual Health Census in rural areas. The survey teams enjoyed the close collaboration of health authorities and physicians in these provinces, who provided necessary data and documents for the study. A minority of the patients in these provinces seek medical care outside the province. A thorough search was done for the records of the residents of these provinces in the major medical centers in major cities close to, but outside, these provinces. The researchers also searched the cancer registry database of Cancer Institute, Tehran, for records of cancer patients from these five provinces. This latter database provided the most reliable and comprehensive data about cancer patients treated in Tehran. We used all of the above methods to make our case finding as complete as possible. Cancer registry methods were reviewed and approved by the DDRC Institutional Review Board.

The data were summarized in a data sheet and coded using the ICD-O. The data were computerized using SPSS (Chicago, IL) software, version 10.0, and MS Excel (Microsoft, Redmond, WA) software with Persian fonts. After data collection was complete, all data were alphabetically organized and duplicate cases with the same name, sex, age and place of residence were eliminated by manual and computerized linkage. Each alphabetical group was assessed manually by two individuals in two different occasions.

We obtained age structures of these five provinces from the 1997 census of Statistics Center of Iran and calculated person-years of the population at risk using each year method. Age- and sex-specific rates, annual age-adjusted rates (ASRs) and their standard errors and truncated age-adjusted rates (TASR) per 100,000 person-years were calculated using the direct methods of standardization to the world population. We also calculated the incidence of colorectal cancer with respect to other cancers in each province and report its incidence rank among other cancers.

Table 1
Age standardized rates (ASRs) of colorectal cancers among all cancers in study provinces

Province	Male				Female			
	Cases	ASR	Se	Rank	Cases	ASR	Se	Rank
Ardabil	116	7.9	0.7	4	74	5.9	0.7	4
Gilan	293	7.8	0.4	3	293	7.4	0.4	3
Mazandaran	297	9.9	0.6	4	239	8.4	0.5	4
Golestan	241	10.7	0.7	3	139	6.6	0.6	3
Kerman	182	6.4	0.5	4	159	6.2	0.5	2
All provinces	1129	8.2	0.25	3	904	7.0	0.24	4

ASR, Age standardized rate per 100,000 (direct method, world standard population); Se, Standard error; Rank, Rank of colon cancer among other cancers.

3. Results

A total of 2055 colorectal adenocarcinoma cases were registered in the database. Among these cases, 1129 (54.9%) were males, 904 (44.0%) were females, and in 22 cases (1.1%) sex was undetermined. Median age (25th–75th percentile) was 57 (43–67) years. Age standardized rates for colorectal adenocarcinoma were 8.2 and 7.0/100,000 for males and females, respectively. CRC was the third and fourth most common cancer among men and women, respectively. Age-standardized rates varied from 5.9 for women residing in Ardabil to 10.7 for men residing in Golestan (Table 1). In each province, CRC ranked between second to fourth among all cancers (Table 1) and constituted approximately 6–8% of all cancers.

Fig. 1 shows age-specific rates for both sexes. The age-specific rates increased monotonically in both men and women. Rates were slightly higher in men than in women (male to female ratio = 1.25), but this difference was limited to those 45 years of age or older.

In all, 349 cases (17%) were <40 years-old at diagnosis, 1531 cases (74.5%) were ≥ 40 years of age; age was undetermined in 175 (8.5%) of cases. However, age-specific rates were lower for all age groups in Iranian population than in the US population (Table 2). Differences between Iranian and US age-specific rates were small in subjects <40, but much larger and more pronounced for individual ≥ 40 years of age. TASR (<40 yrs old) for men and women were 1.4 and 1.2, respectively. TASR (≥ 40 years old) for men and women were 19.6 and 18.3, respectively.

4. Discussion

Some small hospital-based studies have previously shown low rates of colorectal polyps and carcinomas [14,15] and a high proportion (40%) of young-onset CRC cases [16] in Iran. However, the only reliable source of CRC incidence in Iran was a cancer registry that was conducted by the International Agency for Research on Cancer (IARC) and Tehran University Institute of Public Health Research (IPHR) from 1968 to 1971 [17]. This study was conducted in Gilan and Mazandaran provinces, in north of Iran, and the Ardabil district (now Ardabil province), in northwest of Iran, and reported annual truncated incidence rates from 1.5 to 5.5/100,000 in different regions of the registry [17]. Due to a dearth of diagnostic medical facilities and expert clinicians in these provinces in 1970s, the results of this cancer registry may have underestimated cancer rates in Iran [18].

The results of the current study show that ASRs of CRC in Iran are between 7 and 8/100,000 in both men and women, which are higher than the previously reported rates [17]. These incidence rates are close to those reported from other Middle-eastern countries and much lower than those seen in Western countries [2,4,5]. As seen with most other cancers, rates increase monotonically with age in men. The age trend in Iran is, in general, similar to that seen in Western countries, but rates increase much more steeply in the West after age 40.

We observed a slight male preponderance of cases (male to female ratio = 1.25), but higher rates in males

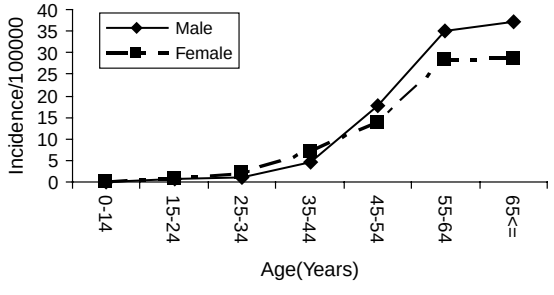

Fig. 1. Age-specific rates of colorectal cancers stratified by sex.

Table 2
A comparison between the colorectal cancer age-adjusted rates per 100,000 in Iran and in the US

Age group	Males		Females	
	Iran	US[a]	Iran	US[a]
0–14	0.1	–	0.1	–
15–24	0.6	–	0.8	–
25–34	1.2	2.9	1.9	2.7
35–44	4.8	10.4	6.8	7.9
45–54	17.7	41.8	13.2	32.9
55–64	34.9	127.1	27.1	87.5
≥65	37.3	355.7	29.2	273.9

[a] US rates have been reconstructed from the 5-year age-specific SEER data from 1995 to 1999 and age structure of the US during the same years.

are restricted to those aged >45. This slight difference was seen in all of the five provinces studied. With few exceptions, slightly higher ASRs of CRC in men have been observed in most areas of the world [2,4], with ratios ranging from close to 1.0 in most reports from developed countries to >2.0 in some of the low-incidence areas.

Previous case-series have reported a higher proportion of young CRC cases in Iran than Western countries [16]. We found that 17% of all CRC cases occurred in individuals younger than 40 years of age. This proportion was close to those seen in other Middle-Eastern countries [11,13] and almost five times as high as the proportions of young-onset CRCs seen in Western countries [6–10]. However, when we compared the age-specific rates of colorectal cancer in Iran and the US, we observed lower CRC rates in all age groups among Iranians than in the US population (Table 2). The rates were, however, close in the younger (<40) age groups, but much higher in the US older (>40) population than in Iranian population with the same age (Table 2). Iran has a very young population; 1997 Census of the Statistics Center of Iran showed that approximately 80% of the population in Iran were younger than 40. Therefore, high proportion of the CRC in young Iranians is explained by two factors: high proportion of young population in Iran, and relatively low rates of CRC in older age groups.

Two different hypotheses can explain the observed patterns of CRC in Iran, as compared those seen in the US and other Western countries. The first hypothesis is that there is a fixed baseline rate of CRC in younger population all around the world. In Western countries, where the environmental factors predispose people to higher risk, there is an increased rate of CRC in older people.

The second hypothesis is that the current pattern of CRC in Iran is the result of Westernization of the country and change in diet and life-style. It is possible that the current older generation of Iran, when young, were exposed to a low-risk environment. Therefore, their CRC risks are much lower than Americans of the same age. The new generation, however, is exposed to a high-risk Westernized environment. Therefore, their rates are slightly lower than the young Americans. The results of a study by Haghighi and colleagues support this hypothesis [14]. In 1976, Haghighi and colleagues examined 801 large intestines from Fars Province of Iran, and found a much lower rate of adenomatous polyps in large bowels of Iranians compared to Americans of the same age, both in younger and older ages [14]. Now, however, CRC rates are close in young Iranians and Americans, but much higher in older Americans. If this hypothesis is correct, we will see a cohort effect, and in the next 10 years, we may see that CRC rate in Iranian population aged 45–54 becomes close to American rates (35/100,000/year). Epidemics of CRC due to Westernization have also been reported in other developing countries [3].

Both of the above hypotheses, however, may explain the high proportion of young CRC cases in Saudi Arabia (23%) [11] and in Jordan (13%) [12]. In Egypt, where the proportion of young cases is exceptionally high (36%) [13], a genetic predisposition is more likely. High proportions of CRC in young population of Egypt have been speculated to be due to unique patterns seen in molecular pathology of this cancer in this country [19].

In summary, we found that Iran is still a low-risk country for CRC—particularly in older population—with an ASR close to 7–8/100,000. The rates were slightly higher in men than in women. The age-specific rates in young Iranian and US population were close, but the rates were much higher in older US population.

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